IN THE UNITED STATES

PATENT AND TRADEMARK OFFICE

Appl. No: 10/071,405

Applicant(s): Frans Andreas Gerritsen, et al.

Filed: February 8, 2002

TC/A.U.: 2600/2624

Examiner: Patrick L. Edwards

Atty. Docket: NL 010106

Title: PROCESSING OF IMAGES IN
A DIRECTION OF SUCCESSION

APPEAL BRIEF

Honorable Assistant Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In connection with the Notice of Appeal dated July 10, 2008, Applicants provide the following Appeal Brief in the above captioned application.

TABLE OF CASES

1. W.L. Gore & Associates, Inc. v. Garlock, Inc., 220 USPQ 303 (CAFC 1983).
2. In re Paulsen, 30 F.3d 1475, 31 USPQ2d 1671 (Fed. Cir. 1994)
3. In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Cir. 1990).
4. Minnesota Min. & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc., 976 F.2d 1559, 24 USPQ2d 1321 (Fed. Cir. 1992).
5. Scripps Clinic & Res. Found. v. Genentech, Inc., 927 F.2d 1565, 18 USPQ2d 1001 (Fed. Cir. 1991).
6. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

1. Real Party in Interest

The real party in interest as assignee of the entire right and title to the invention described in the present application is Koninklijke Philips N.V. having a principle place of business at Groenewoudseweg 2, Eindhoven, The Netherlands.

2. Related Appeals and Interferences

There are no known related appeals or interferences at this time.

3. Status of the Claims

Claims 1 and 4-9 are pending in the present application. Claims 2, 3 are cancelled. All have been finally rejected. The rejected claims 1 and 4-9 are duplicated in the Appendix.

4. Status of Amendments

A final Office Action on the merits was mailed on April 14, 2008. A Reply to the Final Office Action was filed in response thereto traversing the rejections of the final Office Action. A Notice of Appeal was filed on July 10, 2008.

5. Summary of the Claimed Subject Matter[1]

In accordance with an embodiment, method of processing images, in which individual images (1) succeed one another in a direction of succession (6) is disclosed. A multi-dimensional data (2) set is constructed from the individual images (1). The multi-dimensional data (2) set assigns data values to positions in a multi-dimensional space. The multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images. A slice (5) is through the multi-dimensional data set is reconstructed along a cut plane (3) through the multi-dimensional space. Additionally, the method comprises segmenting a region of interest from the one or more relevant images is performed in one or more of the individual

1 In the description to follow, citations to various refence numerals, drawings and corresponding text in the specification are provided solely to comply with Patent Office Rules.It is emphasized that these reference numerals, drawings and text are representative in nature, and in not any way limiting of th true scope of the claims. It would therefore be improper to import any meaning into any of the claims simply on the basis of illustrative language that is provided here only under obligation to satisfy Patent Office rules for

images. The segmenting is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set. An edge (22, 23) is located in the reconstructed slice, and the segmenting in the region of interest is performed on the basis of information in the reconstructed slice along the cut plane (3) through the multi-dimensional data set. Moreover, a direction of the cut plane (3) has a component in the direction of succession (6), and in which a region of interest is located on the basis of the cut plane (3). **(Kindly refer to claim 1, Figs. 1-3 and page 4, line 30-page 5, line 23 of the filed application.)**

In another embodiment, an image processing system that is arranged to process individual images (1) that succeed one another in a direction of succession (6), and to reconstruct a multi-dimensional data set (2) from the individual images (1) is disclosed. The multi-dimensional data set (2) assigns data values to positions in a multi-dimensional space. The multi-dimensional space (2) is set up by the direction of succession (6) and two directions parallel to the surface of the individual images, to reconstruct a slice (5) through the multi-dimensional data set along a cut plane (3) through the multi-dimensional space and to segment a region of interest from the one or more relevant images in one or more of the individual images. The segmentation is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set. An edge (22, 23) is located in the reconstructed slice, and the segmentation in the region of interest is performed on the basis of information in the reconstructed slice along the cut plane (3) through the multi-dimensional data set. The direction of the cut plane (3) has a component in the direction of succession (6). The system is also arranged to locate a region of interest on the basis of the cut plane (3). **(Kindly refer to claim 7, Figs. 1-3 and page 4, line 30-page 5, line 23 of the filed application.)**

In yet another embodiment, a computer program with instructions for processing individual images (1) that succeed one another in a direction of succession (6), and for reconstructing a multi-dimensional data set (2) from the individual images (1)is disclosed. The multi-dimensional data set (2) assigns data values to positions in a multidimensional

maintaining an Appeal.

space, which is set up by the direction of succession (6) and two directions parallel to the surface of the individual images (1). The computer program also includes instructions for reconstructing a slice (5) through the multi-dimensional data set along a cut plane (3) through the multi-dimensional space. The computer program also includes instructions for segmenting a region of interest from the one or more relevant images is performed in one or more of the individual images. The segmenting is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set. An edge (22, 23) is located in the reconstructed slice, and the segmenting in the region of interest is performed on the basis of information in the reconstructed slice along the cut plane (3) through the multi-dimensional data set. The direction of the cut plane has a component in the direction of succession (6); and for locating a region of interest on the basis of the cut plane (3). **(Kindly refer to claim 8, Figs. 1-3 and page 4, line 30-page 5, line 23 of the filed application.)**

6. Grounds of Rejection to be Reviewed on Appeal

The issues in the present matter are whether:

I. Claims 1 and 4-9 are properly rejected under 35 U.S.C. § 102(b) in view of *Pieper, et al.* (U.S. Patent 5,825,908).

7. Argument

In this portion of the Appeal Brief, arguments are provided. Notably, wherever applicable Applicants maintain previous arguments for patentability provided in response to Office Actions.

I. Rejection of Claims 1 and 4-9 under 35 U.S.C. § 102(b) in view of *Pieper, et al.*

a. *Prima facie* case of anticipation not established based on *Pieper, et al*

Claims 1 and 4-9 are rejected under 35 U.S.C. § 102(b) as being anticipated by *Pieper, et al.* (US Patent 5,825,908). For at least the following reasons, Applicants respectfully submit that the rejection is improper and should be withdrawn.

At the outset Applicants rely at least on the following standards with regard to proper rejections under 35 U.S.C. § 102. Notably, a proper rejection of a claim under 35 U.S.C. § 102 requires that a single prior art reference disclose each element of the claim. *See, e.g., W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983). Anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. *See, e.g., In re Paulsen,* 30 F.3d 1475, 31 USPQ2d 1671 (Fed. Cir. 1994); *In re Spada*, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Cir. 1990). Alternatively, anticipation requires that each and every element of the claimed invention be embodied in a single prior art device or practice. *See, e.g., Minnesota Min. & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 24 USPQ2d 1321 (Fed. Cir. 1992). For anticipation, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. *See, e.g., Scripps Clinic & Res. Found. v. Genentech, Inc.*, 927 F.2d 1565, 18 USPQ2d 1001 (Fed. Cir. 1991).

i. Claims 1,7 and 8

Claim 1 is drawn to a method of processing images, and features, *inter alia,*

"...segmenting a region of interest from the one or more relevant images is performed in one or more of the individual images, wherein the segmenting is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set,

locating an edge in the reconstructed slice, *wherein the* ***segmenting in the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant...*** *"*

In a representative embodiment, shown in Fig. 2 of the filed application, a simplified representation of the slice along the cut plane 3 is shown. FIG. 2 notably shows the slices in the cut plane of the region of interest as shown in the three individual images

of FIG. 1. FIG. 2 also shows that the region of interest in the reconstructed slice is clearly separated from image information outside said region of interest. **Notably distinct edges 22, 23 can be seen in the reconstructed slice. The edge of the region of interest in each of the individual images 1 is determined on the basis of the distinct edges 22, 23 in the reconstructed slice.**

The Office Action directs Applicants to column 17, lines 15-35 of the applied art. This portion of the applied art discloses:

> In accordance with the present invention, the appropriately programmed computer 50 then applies a segmentation algorithm of the sort well known in the art to segment out related structure within the patient-specific 3-D database. Preferably computer 50 is programmed to apply a 3-D connected component search through the volumetric data set contained in second section 40 of data storage device or medium 30 so as to determine the set of volumetric samples that are (i) within the range specified for blood, and which (ii) can be connected along a connected path back to one of the seeds, where each of the locations along the path is also within the range specified for blood. The result of this 3-D connected component search is a set of 3-D locations in the volumetric data set which correspond to blood flowing through the blood vessel. For the purposes of the present illustration, this set of 3-D locations can be characterized as the "blood region". The segmented anatomical structure (i.e., the blood in the blood region) can then be highlighted or otherwise identified on each of the 2-D slice images. See, for example, FIGS. 17A and 18A, where the segmented blood region in vascular tissue 205 has been crosshatched to represent such highlighting.

Thus, the portion of the applied art relied upon in the Office Action relates to a highlighting function and not the locating of an edge and segmenting based on the location of the edge. Accordingly, the applied art fails to disclose at least one feature of claim 1. Therefore, a prima facie case of anticipation cannot be made based on this reference and claim 1 is patentable over the applied art. Moreover, claims 4-6, which depend from claim 1, are patentable as a matter of law.

Claims 7 and 8 each includes similar features to those of claim 1 described above. Therefore, these claims are patentable for at least the same reasons. Claim 9, which depends from claim 8, is patentable as a matter of law.

b. Inherency not established

The Examiner asserts:

"It should be noted that edges are inherently identified when the anatomical structure or object of interest is identified in the corresponding 2D slices. There can be no object of interest or anatomical structure without the known location of identified edges which define such a structure."

At the outset, Applicants note that claim 1 recites: ***locating an edge in the reconstructed slice, wherein the segmenting in the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant...***" So, even assuming arguendo that the reference did inherently disclose edges as asserted by the Examiner, the Office Action has failed to establish that segmentation of images is performed on the basis thereof. Stated somewhat differently, even if the edges were disclosed as the Examiner alleges, the rejection fails to establish their use as claimed.

Moreover, the Examiner has not established inherency via established standards. Rather, a mere statement unsupported by required extrinsic evidence is provided.

Applicants direct the Examiner to M.P.E.P. § 2112 IV, which provides that:

> *EXAMINER MUST PROVIDE RATIONALE OR EVIDENCE TENDING TO SHOW INHERENCY*
>
> *The fact that a certain result or characteristic **may occur** or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); In re Oelrich, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "**To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference**, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain*

thing may result from a given set of circumstances is not sufficient.' " In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

(emphasis added).

Furthermore, a claim rejection must be based on objective evidence of record, and cannot be supported merely on subjective belief and unknown authority. See, e.g., M.P.E.P. § 2144.03; *In re Lee*, 277 F.3d at 1344-45, 61 USPQ2d at 1434-35 (Fed. Cir. 2002); *In re Zerko*, 258 F.3d at 1386, 59 USPQ2d at 1697.

No such concrete evidence has been provided by the Examiner here, nor did the Examiner submit an affidavit as required by 37 C.F.R. § 1.104(d)(2) if this proposed motive were based on facts within his personal knowledge (see M.P.E.P. § 2144.03). Applicants respectfully request that such an affidavit be provided if a rejection continues to be made without a citation of any objective evidence. Based on the lack of extrinsic evidence or affidavit, the rejection based on inherency is without merit and is, therefore, improper.

c. The Advisory Action makes assertions not supported by the applied art

The Advisory Action states:

"Pieper teaches that images are generated or reconstructed using data from slice images in a different direction through well know [sic] techniques known in the art. These techniques most likely use interpolation for recreating an image from a series of slice images."

In response to this position taken in the Advisory Action, Applicants submit that a rejection cannot be based on conjecture and unsupported assertions. Rather, a claim rejection must be based on objective evidence of record, and cannot be supported merely on subjective belief and unknown authority. See, e.g., M.P.E.P. § 2144.03; In re Lee, 277 F.3d at 1344-45, 61 USPQ2d at 1434-35 (Fed. Cir. 2002); In re Zerko, 258 F.3d at 1386, 59 USPQ2d at 1697.

No such concrete evidence has been provided by the Examiner here, nor did the

Examiner submit an affidavit as required by 37 C.F.R. § 1.104(d)(2) if this proposed motive were based on facts within his personal knowledge (see M.P.E.P. § 2144.03). Applicants respectfully request that such an affidavit be provided if a rejection continues to be made without a citation of any objective evidence.

The Advisory Action also states:

> "It should be noted that edges are inherently identified when the anatomical structure or object of interest is identified in the corresponding 2D slices. There can be no object of interest or anatomical structure without the known location of identified edges which defined such structure. Indeed there is no structure to be identified without edges that define such a structure. Applicant argues that identifying edges is not inherent to identifying structures in images. The question remains then, how does Pieper identify structures in the 3D reconstructed images without edges? The answer is that it is impossible to identify or [sic] a structure without identifying the edges that define the structure. Applicants are encouraged to provide an example of how a structure might be identified ina [sic] 3D reconstructed image without identifying edges defining the structure."

At the outset, Applicants note that they did not claim that edges were not inherent, but rather inherency had not been established and that even if they were inherent, the claims were not anticipated. To wit, and as noted in the Rule 116 Response and in the traversal above, claim 1 recites: ***locating an edge in the reconstructed slice****, wherein the* ***segmenting in the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant...***" So, even assuming arguendo that the reference did inherently disclose edges as asserted by the Examiner, the Office Action has failed to establish that segmentation of images is performed on the basis thereof. Stated somewhat differently, even if the edges were disclosed as the Examiner alleges, the rejection fails to establish their use as claimed.

In addition, the captioned portion of the Advisory Action makes unsupported assertions regarding the absolute need for known locations of identified edges. Furthermore, the Examiner states without objective evidentiary support that "it is impossible to identify or [sic] a structure without identifying the edges that define the

evidence of record, and cannot be supported merely on subjective belief and unknown authority. See, e.g., M.P.E.P. § 2144.03; In re Lee, 277 F.3d at 1344-45, 61 USPQ2d at 1434-35 (Fed. Cir. 2002); In re Zerko, 258 F.3d at 1386, 59 USPQ2d at 1697.

No such concrete evidence has been provided by the Examiner here, nor did the Examiner submit an affidavit as required by 37 C.F.R. § 1.104(d)(2) if this proposed motive were based on facts within his personal knowledge (see M.P.E.P. § 2144.03). Applicants respectfully request that such an affidavit be provided if a rejection continues to be made without a citation of any objective evidence.

Finally, Applicants respectfully traverse the propriety of the request for evidence tending to prove that a structure might be identified in a 3D reconstructed image without identifying edges defining the structure. According to 35 USC § 102(b), a person shall be entitled to a patent, unless the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States. Thus, the onus is placed on the Office to present a *prima facie* case that an applicant is not entitled to a patent. In that endeavor, there is no requirement that an applicant prove that something is possible when the Examiner contends that the something is impossible. Rather, the Examiner must show with objective evidence that the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States.

iii. Rejections are improper

The rejections of claims 1, 7 and 8 are wholly improper for at least the reasons set forth above. Moreover, claim 4-6 and 9, which depend from claims 1 and 8 are also patentable for at least the same reasons.

8. Conclusion

In view of the foregoing, applicant(s) respectfully request(s): the withdrawal of all objections and rejections of record; the allowance of all the pending claims; and the holding of the application in condition for allowance.

Respectfully submitted on behalf of:
Koninklijke Philips N.V.

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Appendix

Claims on Appeal

Claims on Appeal:

1. A method of processing images, in which
individual images succeed one another in a direction of succession, the method comprising:
constructing a multi-dimensional data set from the individual images,
wherein the multi-dimensional data set assigns data values to positions in a multi-dimensional space, and the multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images,
reconstructing a slice through the multi-dimensional data set along a cut plane through the multi-dimensional space,
segmenting a region of interest from the one or more relevant images is performed in one or more of the individual images, wherein the segmenting is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set,
locating an edge in the reconstructed slice, wherein the segmenting in the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant, wherein
the direction of the cut plane has a component in the direction of succession, and in which a region of interest is located on the basis of the cut plane.

4. A method of processing images as claimed in claim 1, in which respective slices through the multi-dimensional data set are reconstructed along a plurality of cut planes through the multi-dimensional space, and
the directions of the individual cut planes have components in the direction of succession, individual edges are tracked in the individual slices,
and the segmentation of the region of interest in the one or more images is performed on the basis of the individual locations of the respective edges found in the relevant image.

5. A method of processing images as claimed in claim 4, in which

a boundary of the region of interest is derived by interpolation between the individual locations in the relevant image of the respective edges found.

6. A method of processing images as claimed in claim 5, in which the interpolation is performed inter alia on the basis of a priori information concerning the region of interest.

7. An image processing system that is arranged to process individual images that succeed one another in a direction of succession, and

to reconstruct a multi-dimensional data set from the individual images,

which multi-dimensional data set assigns data values to positions in a multi-dimensional space,

which multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images,

to reconstruct a slice through the multi-dimensional data set along a cut plane through the multi-dimensional space, and to segment of a region of interest from the one or more relevant images is performed in one or more of the individual images, wherein: the segmentation is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set; an edge is located in the reconstructed slice, and the segmentation of the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant image; and the direction of the cut plane has a component in the direction of succession, and to locate a region of interest on the basis of the cut plane.

8. A computer readable medium storing a computer program with instructions for processing individual images that succeed one another in a direction of succession, and for

reconstructing a multi-dimensional data set from the individual images,

which multi-dimensional data set assigns data values to positions in a multidimensional space,

which multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images,

reconstructing a slice through the multi-dimensional data set along a cut plane through the multi-dimensional space,

segmenting a region of interest from the one or more relevant images is performed in one or more of the individual images, wherein the segmenting is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set,

locating an edge in the reconstructed slice, wherein the segmenting in the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant, wherein

the direction of the cut plane has a component in the direction of succession, and for locating a region of interest on the basis of the cut plane.

9. A medical diagnostic workstation that is provided with an image processing system as claimed in claim 7, for example, programmed by way of a computer program as claimed in claim 8.

Appendix

Evidence (None)

Appendix

Related Proceedings (None)